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**DISTRICT SURVEY REPORT (DSR) OF  
KALAHANDI DISTRICT, ODISHA  
ON FELDSPAR MINING**

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As per Notification No. S.O. 141(E), 15th January, 2016 & S.O. 3611(E),  
25th July, 2018, New Delhi, Ministry Of Environment, Forest & Climate  
Change (MoEF & CC)



**COLLECTORATE OF KALAHANDI, ODISHA  
FEBRUARY – 2020**

*[Handwritten signatures and initials]*

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*Salim*

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A survey has been carried out by the **District Level Environment Impact Assessment Authority (DEIAA), Kalahandi** with the assistance of Geology Department or Irrigation Department or Forest Department or Public Works Department or Mining Department etc. in the district as per the MoEF, New Delhi, notification S.O. 141(E) dated 15<sup>th</sup> January 2016 to prepare the District Survey Report (DSR) of Kalahandi District (For Feldspar) in the year 2019.

**Forwarded by:**

- i. Sub-Collector cum SDM, Bhawanipatna.**
- ii. Sub-Collector cum SDM, Dharmagarh.**
- iii. CDMO, Kalahandi.**
- iv. Deputy Director Geology, ZS Balangir**
- v. Deputy Director Agriculture, Kalahandi.**
- vi. Deputy Director Horticulture, Kalahandi.**
- vii. SDO Irrigation Division, Kalahandi, Bhawanipatna.**
- viii. ACF North & South Division, Kalahandi.**
- ix. Asst. Engineer (R & B), Kalahandi, Bhawanipatna.**
- x. RO State Pollution Control Board, Rayagada.**
- xi. Mining Officer, Kalahandi.**
- xii. Tahasildar of concerned Tahasil.**



**0. PREFACE**

The main objective of the preparation of District Survey Report (DSR) as per the notification issued by the *Ministry of Environment and Forest and Climate Change Notification No. S.O. 141(E) dated 15/01/2016 & S.O.3611 (E) New Delhi dated 25/07/2018* is for identification of areas of aggradations or deposition & areas of erosion to ensure the mining potential of the District. District Survey Report of Feldspar mining has been prepared in accordance with *Clause-II of Appendix-X* of the said notification.

## 01. INTRUCTION.

The first gazetteer (15 August 1980) of Kalahandi District says that the district comprised of the ex-State Kalahandi minus Kashipur Police Station (the Zamizari of Khariar as Nuapada Sub-division, now Nuapada District). With the merger of princely States with province of Odisha 1948, the ex-State of Kalahandi together with ex-State Patna and Sonapur formed the District of Kalahandi with headquarters at Balangir. On 1st November 1949 Patna and Sonapur areas were separated to form District Balangir; Patna (later Bolangir) Sonapur (later Subarnapur district). And ex-State of Kalahandi, together with Nuapada sub-division which formed a part of Sambalpur district since 1st April 1936, was reconstituted a separate District Kalahandi with Headquarters at Bhawanipatna. As the area comprising Kashipur Police station posed administrative difficulties due to lack of direct communications with the district headquarters, it was separated from Kalahandi on 1st August 1962. Further Nuapada Subdivision was separated on 27 March 1993 from Kalahandi to form new District as Nuapada.

On the basis of Administration Kalahandi District has been divided into 2 Sub-Divisions named as Bhawanipatna & Dharmagarh. As Per the Blocks & Tahasils are concerned the District is divided into 13 Blocks & Tahasils namely Kalahandi, Kesinga, Karlamunda, M.Rampur, Narla, Th.Rampur, Lanjigarh belongs to Bhawanipatna Sub-Division and Jaipatna, Junagarh, Koksara, Golamunda, Kalampur and Dharmagarh belongs to Dharmagarh Sub-Division. There are 310 Gram Panchayats in the District.

Kalahandi is situated at a distance about 400Km from the state capital & international airport Bhubaneswar and at a distance about 500 Km from the shore line of Bay of Bengal.

Highways like NH-26, SH-16, SH-06, SH-06A, SH44 etc. passes within the district.

## 02. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT.

A great variety of major mineral potential like Bauxite, Graphite, Galena, Ruby & Iolite and Specified Minor Minerals like Quartz, Feldspar & Decorative Stone (Granite) are available in the district.

**Bauxite** occurs in Karlapat-Pollingpadar, Kutrumali-Tangridongar, Lanjigarh -Niyamgiri, Keluamali, Krishanmali.

**Graphite** occurs in Sargipada, Gaidar, Singjharan, Lamer & Badibahal.

**Galena** occurs in Sisakhal.

**Precious Stone (Ruby)** occurs in Jhillingdhar, Hinjlibahal, Kerumurda, Sirja, Tandla, Banjipadar, Sargiguda.

**Semi-Precious Stone (Iolite)** occurs in Dedar, Labanyasar, Bondoguda, Kutingpadar, Ghatpada, Rengali, Dharmagarh, Golamunda and Th.Rampur Tahasils.

**Quartz and Quartzite** occurs in Kalahandi, Kesinga, Jaipatna, Junagarh, Dharamgarh, M.Rampur, Narla, Koksara, Golamunda, Kalampur Tahasils.

**Feldspar** occurs in Bhikajharan of Kalahandi Tahasil.

**Decorative Stone (Granite)** occurs in Lanjigarh & Kalahandi Tahasil.

### (a) Major Mineral:-

In Kalahandi district, presently there are eight nos. of mining leases of semiprecious stone out of which only two nos. of mining leases are working i.e. Labanyasar Iolite Mines over an area of 2.505 hectares of Sri Debraj Meher & Bondoguda Iolite Mines over an area of 2.023 hectares of M/s Manikeswari Gems Pvt. Ltd.

### (b) Specified Minor Minerals:-

(i) One Quarry lease for decorative stone (Granite) has been granted in favour of Sri Harendra Kumar Patnaikin village-Nuapada under Kalahandi Tahasil over an area of 8.575 hectares for decorative stone. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease, which is under consideration of the Govt.

Besides this, three nos. of prospecting licenses for decorative stone (Granite) have been granted i.e. Karlasoda Decorative Stone (Granite) Quarry over an area of 13.464 hectares in village-Karlasoda under Kalahandi Tahasil in favour of Smt. P.Ramadevi, Chandanpur Decorative Stone (Granite) Quarry over an area of 3.602 hectares & Chandanpur Decorative Stone (Granite) Quarry over an area of 9.696 hectares in village-Chandanpur under Lanjigarh Tahasil in favour of Jay Minerals Prop. Ajay Agrawal.

(ii) There are six nos. of non-working Quartz mines in the district. Out of six, two mining leases had been granted in favour of Shreedhar Minerals, Proprietor Sri M.N. Pattjoshi at village Patharla over an area of 3.864 hectares under Kesinga Tahasil and at village Santemri over an area of 3.148 hectares under Jaipatna Tahasil.

Quartz Mines in village Sidingpadar over an area of 18.818 hectares under M-Rampur Tahasil has been granted in favour of Sri Samarendra Pratap Singh Deo. Quartz mines in village Beherakuni over an area of 3.318 hectares under Kalahandi Tahasil has been granted in favour of Sri S.K.Mund. Other two Quartz mines leases have been granted in favour of M/s Parvathi Impex, the leases are in village-Bhejiguda over an area of 22.048 hectares under Jaipatna Tahasil and at village-Karlaguda over an area of 7.292 hectares under Koksara Tahasil.

The above six Quartz Mining leases are under consideration for extension of Mining Lease by Government.

(iii) One Mining lease for Quartz and Feldspar has been granted in favour of M/s Shreedhar Minerals, Proprietor Sri M.N. Pattjoshi over an area of 5.147 hectares on Dt. 14.06.1982. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease which is under consideration of Govt.

(iv) Three nos. of Prospecting Licenses (PLs) have been granted for Quartz, one in favour of Sri Rabindra Kumar Lalat village-Dulkibandha under Jaipatna Tahasil over an area of 4.945 hectares and other two PLs have been granted in favour of M/s Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Khinbahali over an area of 2.428 hectares under Junagarh Tahasil and at village Bhalubutra over an area of 2.873 hectares under Jaipatna Tahasil.

(v) One Prospecting License has been granted for Quartz and Feldspar in favour of M/s Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Bhikajharan under Kalahandi Tahasil over an area of 12.638 hectares.

**(b) Other than specified minor mineral:-**

Other than specified minor minerals such as riverbed sand and ordinary stone (road metal) are also available in the district.

### 03. GENERAL PROFILE OF THE DISTRICT.

Present Kalahandi District covering a geographical area of 7920 sq km lies in between 19.175489<sup>o</sup> to 20.454517<sup>o</sup> North Latitude and 82.617767<sup>o</sup> to 83.794874<sup>o</sup> East Longitude having a population of total population of 1,576,869 as per the Census 2011. Out of which 787,101 are males while 789,768 are females. In 2011 there were total 401,251 families residing in Kalahandi district. The District occupies the South Western portion of Odisha, bordered to the North by the Balangir District and Nuapada District, to the South by the Nabarangpur District, Koraput District and Rayagada District, and to the East by the Rayagada, Kandhamal District and Boudh District.

The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45+ degree Celsius, whereas the minimum temperature recorded is 4<sup>o</sup>Celsius. The District experiences the average annual rainfall as 1378.20 mm. The monsoon starts late in June and generally lasts up to September.

Kalahandi District is largely an agriculture based Economy. The District is rich with agriculture. Dharamgarh sub division was historical known for rice production in Odisha. Since 2000s the Indravati Water Project, second biggest in the state has changed the landscape of southern Kalahandi, leading to two crops in a year. Because of this, blocks like Kalampur, Junagarh, Jaipatna, Dharamgarh are the leading producer of paddy in district. Cotton is widely cultivated in areas of Kesinga, Bhawanipatna, Golamunda blocks. Forest based products like Mahua, Kendu-Leaf, Wood, Timber and Bamboos also contribute to local economy largely. Kalahandi District supply substantial raw materials to paper mills in neighbouring Rayagada District.

Kalahandi District celebrates many festivals round the year. Chhatra Jatra in Bhawanipatna, Deepawali, Rathajatra, Shivaratri, Holi, Janmastami, Ramanabami are the famous festivals celebrated by

local people with fun and fair. There are also some other local festivals like Khandabasa, Nuakhai, Amnuan, Kandulnuan, Semnuan, Dumernuan, Kalahandi Utsav, Ghanta Jatra that are celebrated in the District.

Many eminent personalities have taken birth on the soil of Kalahandi District. Rindo Majhi (freedom fighter in Odisha), Pratab Kesari Deo (former MP and ex- Maharaja of Kalahandi), Chakra Bisoi (freedom fighter), Ram Chandra Patra (bureaucrat, social worker, administrator), Natyarashmi Prafulla Ratha, Dayanidhi Nayak (former minister), Jayanta Kumar Behera (social activist and artist) and mountaineer Jogabyasa Bhoi (first from district to climb Mount Everest) are a few among them.

The district Kalahandi is situated at the south western part of Odisha constituting part of Western Ghat Mobile Belt normally a rugged hilly terrain. The district covers a number of new series Topo Sheets i.e. F44W16, E44E9, E44E10, E44E11, E44E13, E44E14, E44E15, E44E16, F44X3, F44X4, F44X7, F44X8, F44X11, F44X12, F44X16, E44F1, E44F2, E44F3, E44F5 & E44F6.

Kalahandi district is physiologically a complex terrain having numerous numbers of hills, moulds, plane lands, river beds, agricultural lands, forest growth areas etc. In the southernmost part of the district there is Indravati Reservoir catchment area which is also shared by Nawarangpur district. Adjacent to reservoir catchment area hilly terrain present which have an elevation range from mean sea level about 700m to 1000m. Hills and mounts are more common in the south to Bhawanipatna where as in the north part is the less hills compared to southern part possesses an elevation range between 250m to 800m from MSL. As the district is a part of Eastern Ghat Mobile Belt so the rock types are mostly homogeneous in nature, so the drainage pattern developed in the region is dendritic pattern. The main drainage trend

flows from the south-west to north-east direction within the district. There are several seasonal nala/dry nala & a few perennial natural drainage exists within the district. Main river that touches the district is *Tel River*, in addition to that a few other small rivers present within the district namely *Hati Nadi*, *Udanti Nadi*, *Sagada Nadi*, *Kamal Nadi*, *Ret Nadi*, *Uttei Nadi* etcetc.

The main township that is developed in the district is Bhawanipatna also is the district head quarter, which is present in the central part of the district and connect to all parts of the district through road ways.

There are a number of reserve forests present within the district a few major RF are namely *Benakhamar RF*, *Udaygiri RF*, *Singari RF*, *Gopalpur RF*, *Indravati RF*, *Phatadhara RF*, *Machul RF*, *Hatisal RF*, *Kiding RF*, *Bazargarh RF*, *Benagurha RF*, *Urladani RF*, *Taprang RF*, *Telan RF*, *Satami RF*, *Sulia Block A RF* ect. In addition to the reserve forests there is a wild life sanctuary present in the district namely *Karlapat Wild life sanctuary*.

#### 04. GEOLOGY OF THE DISTRICT.

Kalahandi District is part of Eastern Ghat Super Group, the Eastern Ghats are a discontinuous range of mountains along India's eastern coast. The Eastern Ghats run from the northern Odisha through Andhra Pradesh to Tamil Nadu in the south passing some parts of Karnataka and in the Wayanad district of Kerala. They are eroded and cut through by four major rivers of peninsular India, viz. Godavari, Mahanadi, Krishna, and Kaveri.

The mountain ranges run parallel to the Bay of Bengal. The Deccan Plateau lies to the west of the range, between the Eastern Ghats and Western Ghats. The coastal plains, including the Coromandel Coast region, lie between the Eastern Ghats and the Bay of Bengal. The Eastern Ghats are not as high as the Western Ghats. The Eastern Ghats are older than the Western Ghats, and have a complex geologic history related to the assembly and breakup of the ancient supercontinent of Rodinia and the assembly of the Gondwana supercontinent.

The Eastern Ghats on the east coast of India is a largely granulite terrain but also exposes granites, migmatites, anorthosites and alkaline rocks. This granulite belt has had a prolonged history of mountain building from late Archaean to late Proterozoic. During this long period the Eastern Ghats mobile belt witnessed repeated folding and possibly polycyclic metamorphism. Some recent findings suggest breaks between orogenic cycles and a proterozoic reworking of Archaean granulites. Extreme-temperature crustal metamorphism under fluid-absent conditions and crustal anataxis in huge thickness of pelitic to psammitic protoliths producing leptynites are some of the important results of recent investigations of the Eastern Ghats mobile belt. Different generation of charnockites are present in the Eastern Ghats belt, but charnockitisation of granitic gneisses is yet to be documented. Some apparently nascent growths, the patchy charnockites in the

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Chilka area are shown to be relict of older charnockitic rocks that suffered granulite-facies metamorphism and attendant migmatisation.

Event Stratigraphy of the Eastern Ghat Mobile Belt is as follows;

Age(Ma)	Event				
550-650	Exhumation & Stabilisation (Pan-African)				
800-850	Emplacement of Anorthosite Massifs, Some Alkaline Rocks (?) Younger Granitoids are charnokites				
950-1100	Main Eastern Ghat Orogeny(=Grenville)				
	<table border="1"> <tr> <td>Khondalite Group</td> <td>           Garnet-Sillimanite- Graphite Gneiss(Khondalite) with            minor cordierite-Saphrine-Spinel Gneiss(Mg-Al)            Calc- Silicate rocks &amp; rare Marbles            Quartzite (Garnet <math>\pm</math> Sillimanite)         </td> </tr> </table>	Khondalite Group	Garnet-Sillimanite- Graphite Gneiss(Khondalite) with minor cordierite-Saphrine-Spinel Gneiss(Mg-Al) Calc- Silicate rocks & rare Marbles Quartzite (Garnet $\pm$ Sillimanite)		
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~1500	Emplacement of Alkaline rocks along with the rift Margin				
	<table border="1"> <tr> <td>Evolution of platform</td> <td>(Purana) basins like Cuddahpah ,Chhatishgarh, Indravati etc.</td> </tr> <tr> <td>1800-1600</td> <td>Evolution of Nellore-Khemmam schist belt in Dharwar Craton</td> </tr> </table>	Evolution of platform	(Purana) basins like Cuddahpah ,Chhatishgarh, Indravati etc.	1800-1600	Evolution of Nellore-Khemmam schist belt in Dharwar Craton
Evolution of platform	(Purana) basins like Cuddahpah ,Chhatishgarh, Indravati etc.				
1800-1600	Evolution of Nellore-Khemmam schist belt in Dharwar Craton				
2600-2800	Charnokite & Gneisses of the basement (WCZ).				

## 05. DRAINAGE AND IRRIGATION PATTERN.

Kalahandi district is a physically hilly terrain having majorly dendritic drainage pattern, there is only one main river named *Tel River* flows in the district in the northern part of district, in addition to that several immature rivers namely *Hati Nadi*, *Udanti Nadi*, *Sagada Nadi*, *Kamal Nadi*, *Ret Nadi*, *Uttei Nadi* etc. originate & flows in the district also few of them act as the tributary to *Tel River*. The distance of the sources from the river origin is geologically very short, hence this can be concluded that the rate of deposition of sand in *Tel River* is moderate, while in rest rivers within the district the rate of deposit is slow.

Additional river source details are given in the following table

Sl no.	Name of river	Area (sq. km drained)	% area drained in the District
01	Tel River	2850	60%
02	Hati River	735	100%
03	Udanti River	1800	100%
04	Sagada River	360	100%
05	Kamal River	350	100%
06	Ret River	810	100%
07	Uttei River	420	100%

**06. LAND UTILISATION PATTERN IN THE DISTRICT: FOREST, AGRICULTURAL, HORTICULTURAL, MINING ETC.**

General land information of Kalahandi district is as follows;

Sl. No				High	Med.	Low	
1	Geographical area		Ha.				792000
2	Cultivable area		Ha.	237856	85279	67865	391000
3	Forest area		Ha.				314000
4	Misc. Tree & Grooves		Ha.				8000
5	Permanent Pasture		Ha.				23000
6	Culturable Waste		Ha.				21000
7	Land put to non agriculture. Use		Ha.				35000
8	Net shown area	Kharif-2018	Ha.				383721
9	Gross crop area	2018-19	Ha.				600030
10	Cropping intensity	2018-19	Ha.				156%
11	Irrigated area	Kharif-2018	Ha.				143688
12		Rabi 2018-19	Ha.				84721
13	Cultivated area	For 2019	Ha.	217139	90962	75620	383721
14	Paddy area	For 2019	Ha.	46976	79261	75620	201857
15	Non paddy area	For 2019	Ha.	170163	11701	0	181865
16	DAO Circle		Nos.				4
17	AAO Circle		Nos.				26
18	AC/VAW Circle		Nos.				310

**Forest:**

Forest land use as per the concern authority is as follows;

**Abstract of area statement of Kalahandi North Division**

SL No	Legal status of the forest Blocks	Name of the Range										Total	
		Bhawanipat na		M.Rampur		Narla		Kesinga		Kegaon		No. of Blo cks	Area in Ha.
		No. of Blo cks	Area in Ha.										
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Reserve Forest	12	15653. 00	11	21475 .00	7	15141 .00	3	9824. 00	10	20521 .00	43	82614. 00
2	P.F.	-	-	-	-	-	-	-	-	-	-	-	-
3	PRF notified u/s- 4	1	6720.2 0	11	15174 .98	6	4469. 44	-	-	-	-	18	26364. 62
4	PRF not notified u/s- 4	2	9255.7 0	9	2551. 08	5	4787. 93	6	727.1 4	16	1285. 75	38	18607. 60
5	Village Forest	14	89.524	3	12.63 8	-	-	12	77.76	1	20.00	30	199.65
6	Non Forest land mutated in favour of FD	1	436.00	-	-	-	-	-	-	-	-	1	436.00
<b>Total =</b>		<b>30</b>	<b>32154. 42</b>	<b>34</b>	<b>39213 .43</b>	<b>18</b>	<b>24398 .37</b>	<b>21</b>	<b>10628 .90</b>	<b>27</b>	<b>21826 .75</b>	<b>130</b>	<b>12822 1.87</b>

## Abstract of area statement of Kalahandi South Division

S L. N O	Legal status of the forests + Blocks	Name of the Range														Total	
		Biswanath pur		Dharmag arh		Jaipatna		Junagar h		Th.Rampur North		Th.Rampur South		Karlapat		No. of Blocks	Area in Ha.
		No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1	Reserve Forests	16	1713 9.00	5	1308 3.00	8	299 2.00	7	523 9.00	9	717.0 0	4	6086. 00	-	-	49	4525 6.00
2	P.F.	1	17.48 3	-	-	-	-	-	-	-	-	-	-	-	-	1	17.48 3
3	PRF notified u/s-4	9	1134 9.02	-	-	-	-	2	327. 10	7	9288. 59	3	756.1 9	1	462.0 0	22	2218 2.90
4	PRF not notified u/s-4	10	1480. 32	-	-	-	-	6	345 3.02	1	346.0 0	-	-	1	760.1 7	18	6039. 51
5	Village Forests	-	-	1	20.00	-	-	-	-	3	20.00	6	60.00	-	-	10	100.0 0
6	Non Forests land mutated in favour of FD	2	43.26 1	-	-	1	25.4 0	-	-	1	22.41 6	5	322.9 53	-	-	9	414.0 3
<b>Total =</b>		<b>38</b>	<b>3002 9.08</b>	<b>6</b>	<b>1310 3.00</b>	<b>9</b>	<b>301 7.40</b>	<b>15</b>	<b>901 9.21</b>	<b>21</b>	<b>1039 4.01</b>	<b>18</b>	<b>7225 .14</b>	<b>2</b>	<b>1222. 17</b>	<b>10 9</b>	<b>7400 9.92</b>

**Agriculture:**

Please refer general information table above.

**Horticulture:**

A detail of the land use given by concern authority is as follows;

Sl. No	Crop	Area (in Hectares)
1	Fruits	17944.00
2	Plantation Crops	2100.00
3	Spices	5389.00
4	Vegetables	23300.00
5	Flowers	269.00
Total =		49002.00

**Mining:**

The total area considered for mining activity for all minerals shall be the mining area within the district.

**07. SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT.****Hydrogeology**

The hydrogeological framework of the district is mainly controlled by the geological set up, rainfall distribution and the degree of secondary and primary porosities in the geological formations for storage and movement of ground water. Since major parts of the district are underlain by hard rocks of diverse lithological composition and structure, the water bearing properties of the formations also vary to a great extent. The area has undergone several phases of intense tectonic deformations which has been responsible for the development of deep seated intersecting fracture system. Hydrogeological surveys in the district reveals the lithological characteristics and the role of tectonic deformation on the occurrence and distribution of ground water reservoirs and their water bearing and water yielding properties. Lineaments formed due to tensile deformation were picked up from remote sensing studies. The structural elements mainly control the occurrence and movement of groundwater in the typical fractured crystalline basement terrain. The major hydrogeologic units in the district can be subdivided into two broad groups.

- (i) Areas underlain by fractured, fissured and consolidated basement rock formations.
- (ii) Areas underlain by recent unconsolidated alluvial formations.

**Water bearing properties of the Consolidated formations :**

The crystalline rocks like granite gneisses, khondalites, charnockites, quartzites, which are devoid of primary porosity, occupy about 95% of the area of the district. The weathered residuum and jointed & fractured portion of these consolidated rocks constitute principal water bearing horizons. The thickness of the weathered zone is generally more in the topographic lows and undulating plains than in the high land areas. Ground water occurs under phreatic condition in the weathered zone and in semi-confined to confined condition in deeper fractured zones. The water yielding capacity of fractured rocks largely depends on the extent of fracturing openness and size of fracture and nature of their interconnections. Usually two to four water bearing fractures occur down to a depth of 100m below ground level. Potential fracture zone is encountered even at depth of 194 m at Dadpur (Block-Narla).

**Granites and Granite Gneisses:** These are the most predominant rock types in the district occupying undulating terrain and topographic lows. On weathering these rocks yield sandy residuum and the intensity of weathering is controlled by the presence of open joints and foliations. Joints and fractures are well-connected creating free circulation of ground water. In general these rocks can sustain yield between 3 and 18.6 lps depending on topographic setting, thickness of weathered residuum, number of saturated fracture zones encountered and their interconnection as inferred from the ground water exploration carried out by CGWB in the district. The weathered zones in the granite gneisses can be developed through open wells and bore wells..

**Khondalites :** The Khondalites, in general occupy the hills and have limited ground water development potentials except when they occupy low laying areas. Due to well-foliated nature of these rocks, weathering is quite deep in low laying areas. These rocks are also well jointed. The thickness of the weathered zone ranges from 12 to 20 m. Ground water development potential of these rocks is meager except in low laying areas. The yield of the

bore wells ranges from 1 to 4 lps as revealed by the ground water exploration carried out by CGWB in the district.

**Charnockite:** In these rocks weathering is not pronounced and foliations and joints are not well developed. These rocks are mostly hard, compact and massive. The thickness of weathered zone ranges from 6 to 10 m. Due to hard and compact nature of the rocks ground water development prospects in the charnockite is not good and the yield from the bore wells is very poor.

**Pegmatite and Quartz veins:** These are coarse grained and hard. These form good aquifers when fractured and friable.

**Khondalites :** These rocks generally form steep linear ridges hence don't form potential aquifers. Well foliated nature of these rocks allows deep weathering. In the pediment areas, the thickness of weathering is varying from 5 to 32m. Ground water occurs under water table condition in the weathered zone and circulates through deeper fractures. The yield of bore wells range from 1 to 5 LPS. The specific capacity of the dug wells ranges from 2.3 to 13.3 LPM/m draw down.

**Charnockite :** These formations are of very much restricted occurrences in the district. Due to paucity of joints and fractures the thickness of weathering in these formations is limited up to 10m. Due to the compact nature and less weathering, ground water prospects in charnockites are not good.

**Gabbro – Anorthosites :** The rheologic property of these rocks resembles with charnockite, Barring few locations dismal weathering and lack of fracturing renders these formation as a bad water yielder. The Sp. Capacity of dug wells in anorthosite vary from 16 to 102 LPM/M drawdown.

**Quartzites :** This unit also less fractured and weathered hence do not form good aquifers. However fractured quartzites along lineaments yield good amount of water.

**Pegmatite and quartz vein :** These are course grained intrusive and form good aquifers when fractured.

***Water bearing properties of the unconsolidated Formation:***

Laterites belonging to the Pleistocene age and alluvium of Sub-recent to Recent age constitute the unconsolidated formations in the district.

**Laterites and lateritic gravels:** Laterites of both high and low level environments occur extensively in the district forming capping over the older

formations. Laterites occurring as capping over older formations are vesicular, ferruginous and highly porous in nature and at places form good near surface aquifers to be tapped through dug wells. Ground water generally occurs under phreatic condition in the shallow zone.

**Alluvial deposits:** The alluvial sediments of recent origin occur as thin discontinuous patches along the prominent drainage channels and form prolific aquifers under favorable conditions. Of particular interest are the alluvial deposits occurring as discontinuous patches in the flood plains of major rivers such as Tel, Udanti, Ret and the alluvial fan deposits in Indravati, Nagavalli and Vansadhara sub basins. The thickness of alluvial deposits varies from 10 to 30 m in the Indravati and Tel sub basins. These mainly consist of silt, sand with gravel and clay and form potential shallow aquifers. Ground water occurs under phreatic condition and the water table lies at shallow depths. These deposits are very suitable for ground water development through dug wells and shallow tube wells. Yield of tube wells in the alluvium varies from 5 to 10 lps for drawdown ranging from 5 to 8 m.

#### **Aquifer Characteristics of Crystalline:**

In the hard crystalline rock recharge of ground water from precipitation or seepage from surface water bodies percolate into the weathered (saprolite) zone. In case the underlying basement rocks (both weathered and fresh) are incised by open fractures, the downward movement of the water from the upper regolith zone (comprising the top soil and saprolite horizon) is facilitated. In the saprolite/ regolith horizon ground water generally occurs under unconfined condition where as in the fractured bedrock aquifers it occurs under semi-confined to confined conditions. The ground water potentials of various zones i.e. saprolite (tapped by dug wells), weathered basement rock and shallow fractured basement rock horizon (tapped by the hand pumps) and deeper fractured basement rock (tapped by the deep boreholes by CGWB) vary considerably depending upon their lithological and structural characteristics.

### Depth to Water Level (Pre-monsoon and Post-monsoon, 2011)

The depth to water level is measured from the National Hydrograph Stations situated in different blocks of the Kalahandi District. The Pre monsoon, 2011 water level data varies from 1.3 mbgl (Ranmalchak) to 9.4 mbgl(Dalguma). The depth to water level data of Post-monsoon, 2011 represents 0.84 mbgl (Ranmalchak) to 4.47 mbgl (Kesinga).

### Seasonal Fluctuation

A study of the map reveals that in the major parts of the district fluctuation of the water table is in the range of 2m to 4m. The fluctuation ranges from 0.22-6m. The seasonal fluctuation of ground water level is more than 4 meters in the northeastern hilly areas of the district (parts of Rampur Madanpur and Narla blocks). But valley and canal command areas show water level fluctuation within 2 meters.

## 08. RAINFALL OF THE DISTRICT AND CLIMATIC CONDITION.

The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45+ degree Celsius, whereas the minimum temperature recorded as 4°Celsius. The District experiences the average annual rainfall as 1664.633 mm. The monsoon starts late in June and generally lasts up to September.

### MONTH WISE RAINFALL DATA OF KALAHANDI DISTRICT

Year	2017	2018	2019
MONTH	AVERAGE RAINFALL in mm	AVERAGE RAINFALL in mm	AVERAGE RAINFALL in mm
January	0	0	1.82
February	0	0	6.2
March	15.52	0	8.63
April	2.46	14.52	10.54
May	16.5	40.12	23.48
June	209.64	106.44	156.98
July	511.85	652.15	454.07
August	342.65	815.76	657.01
September	208.94	231.42	253.3
October	116.66	59.88	--
November	1.16	0	--
December	0	76.18	--
Total	1425.38	1996.47	1572.05

**09. DETAILS OF THE MINING LEASES IN THE DISTRICT AS PER THE FOLLOWING FORMAT.**

*There is no working Feldspar Mines Within the district.*

Sl.No.	Name of the Minerals	Name of the Lessee	Address & Contact No. of Lessee	Mining Lease Grant Order No. & Date	Area of Mining lease (Ha)	Period of Mining Lease (Initial)		Date of Commencement of Mining Operation	Status ( Working/ Non-Working/ Temp. Working for dispatch etc)	Obtained Environmental Clearance (Yes/ No), If Yes Letter No. with Date of Grant of EC	Location of the Mining Lease ( Latitude & Longitude)
						From	To				
1	2	3	4	5	6	7	8	11	12	14	15
1	Bhikajharan Quartz & Feldspar Mines	M/s. Shreedhar Minerals	Prop. Sri M.N. Pattjoshi, Irrigation Colony, Bhawanipatna, Kalahandi Mob-9437732691	No.4096/SM Dt. 13.02.1981	5.147	14.06.1982	13.06.2002	22.07.1982	Non-Working	No	BHIKAJHARAN Latitude- 20° 01' 20" to 20° 01' 28" N Longitude- 83° 04' 40" to 83° 05' 49" "E"

**NB:** in the above table omitted Columns are,

Column 9 & 10 Period of Mining lease (1st/2nd...renewal)-NA

Column 13 all **Non-captive**

Column 16 Method of Mining (Opencast/Underground) - **All Open cast**

**10. DETAILS OF ROYALTY OR REVENUE RECEIVED IN LAST THREE YEARS**

*No revenue or Royalty has been collected for Feldspar in last three years.*

**11. DETAILS OF PRODUCTION OF MINOR MINERAL IN LAST THREE YEARS.**

*No Production of Feldspar has been done in last three years.*

**12. MINERAL MAP OF THE DISTRICT.**

*Please refer Plate-IV.*

**13. LIST OF LETTER OF INTENT (LOI) HOLDERS (FELDSPAR) IN THE DISTRICT ALONG WITH ITS VALIDITY AS PER THE FOLLOWING FORMAT.**

Sl.No.	Name of the Minerals	Name of the Lessee	Address & Contact No. of Letter of Intent Holder	Letter of Intent Grant Order No. & Date.(PL grant order No.)	Area of Mining Lease to be allotted (Ha.)	Validity of LOI(PL)	Use (Captive/ Non-Captive)	Location of the Mining Lease (Latitude & Longitude)
1	2	3	4	5	6	7	8	9
1	Bhikajharan Quartz & Feldspar Mines	M/s. Shreedhar Minerals	Prop. Sri M.N. Pattjoshi, Irrigation Colony, Bhawanipatna, Kalahandi Mob- 9437732691	No. 7840/SM Dt. 09.07.1990	12.638	2 years	Non-Captive	Latitude- 20° 01' 04" to 20° 01' 20" N Longitude- 83° 04' 40" to 83° 05' 49" E

21

48

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*[Signature]*

**14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT.**

As per the data provided by the concern authority the Reserves of the deposits within the leases are as follows;

Potential Reserve of Feldspar as per Prospecting Report/approved Mining Plan of Mines			
Sl. No.	Name of the Source	Geological Reserve as per approved Mining Plan of the mines(MT)	Minable Reserve as per approved Mining Plan of the Mines(MT)
1	Bhikajharan Quartz & Feldspar Mines of M/s Shreedhar Minerals over an area of 5.147 hectares	After detailed exploration of the mine the geological reserve of Feldspar can be estimated.	After detailed exploration of the mine the Minable reserve of Feldspar can be estimated.
2	Bhikajharan Quartz & Feldspar Mines over an area of 12.638Ha	26512	26512





**15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT.**

Feldspar is the most plentiful group of minerals in the earth's crust, forming about 60% of earthly rocks. Most deposits offer sodium feldspar as well as potassium feldspar and mixed feldspars. Feldspars are primarily used in industrial applications for their alumina and alkali content. Feldspars are alumina silicates containing potassium, sodium, and a small amount of calcium, and usually are embodied in rocks such as granite or exist in large amounts, for example in pegmatite. Alkali feldspars are one of the basic raw materials of ceramic and glass industries. One of the most important feldspar contributions is the control of melting as it does not have a fixed melting point but it melts stage wise. Feldspar is distinguished by the low rate and balanced melting over the required range of temperature. This is of great importance for both ceramics and glass manufacturing processes due to its role in helping the melting of quartz and clays. Moreover, feldspar is important for the inflection step of ceramic and glass formation. The glassy phases are formed at low temperatures due to the function of feldspar as a fluxing agent, thus it is the source of alkalis and alumina during the formation of these phases. Feldspars develop the mechanical properties of the ceramic and glass body such as strength, toughness, and durability.

**16. USE OF MINERAL.**

Feldspar, any of a group of alumina-silicate minerals that contain calcium, sodium, or potassium. Feldspars make up more than half of Earth's crust, and professional literature about them constitutes a large percentage of the literature of mineralogy. Feldspars are used widely in the glass and ceramics industries. Alkali feldspars are more commonly used commercially than plagioclase feldspars. Albite, or soda spar as it is known commercially, is used in ceramics. The feldspar-rich rocks larvikite and a few anorthosites are employed as both interior and exterior facing slabs.

**17. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS.**

There is a normal demand of Feldspar in the state market, and the district is not totally explored for feldspar deposits. Hence the compliance of the existing leases are on progress to supply the raw material as per the demand.

**18. MINING LEASES MARKED ON THE MAP OF THE DISTRICT.**

*Please refer Plate-V*

**19. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASES VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE).**

Quarries existing within 500m radius are considered as cluster of Mining Leases as per the MoEF guide lines.

There are no Feldspar Mining leases exist within 500m radius to each other.

**20. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT.**

The Karlapat sanctuary over a notified area 147.66 sq. km is located in Kalahandi South Division which is 12km from Bhawanipatna in Kalahandi district covering a dense patch of lush green dry deciduous forest. A beautiful waterfall, 'Phurlijharan' has been developed as a picnic spot for the local visitors and draws large number of visitors from far off places in and around Kalahandi District. Karlapat Wildlife Sanctuary is home to plethora wildlife animals and birds. The sanctuary is rich in wildlife such as leopard, gaur, sambar, nilgai, barking deer, mouse deer, soft claws ottawa, a wide variety of birds and reptiles.

## **21. IMPACT ON THE ENVIRONMENT (AIR, WATER, NOISE, SOIL, FLORA & FAUNA, LAND USE, AGRICULTURE, FOREST ETC.) DUE TO MINING ACTIVITY.**

Mining is the extraction of minerals and other geological materials of economic value from deposits on the Earth. Mining adversely affects the environment by inducing loss of biodiversity, soil erosion, and contamination of surface water, groundwater, and soil. Mining can also trigger the formation of sinkholes. The leakage of chemicals from mining sites can also have detrimental effects on the health of the population living at or around the mining site.

As mentioned above, mining activities can harm the environment in several ways.

### **Impacts on Air**

Air quality is adversely affected by mining operations. Unrefined materials are released when mineral deposits are exposed on the surface through mining. Wind erosion and nearby vehicular traffic cause such materials to become airborne. Lead, arsenic, cadmium, and other toxic elements are often present in such particles. These pollutants can damage the health of people living near the mining site. Diseases of the respiratory system and allergies can be triggered by the inhalation of such airborne particles.

### **Impacts on Water**

Mining also causes water pollution which includes metal contamination, increased sediment levels in streams, and acid mine drainage. Pollutants released from processing plants, tailing ponds, underground mines, waste-disposal areas, active or abandoned surface or haulage roads, etc., act as the top sources of water pollution. Sediments released through soil erosion cause siltation or the smothering of stream beds. It adversely impacts irrigation, swimming, fishing, domestic water supply, and other activities dependent on such water bodies.

High concentrations of toxic chemicals in water bodies pose a survival threat to aquatic flora and fauna and terrestrial species dependent on them for food. The acidic water released from metal mines or coal mines also drains into surface water or seeps below ground to acidify groundwater. The loss of normal pH of water can have disastrous effects on life sustained by such water.

**Noise impacts**

Noise pollution mainly due to operation of machineries, occasional plying of machineries and drilling & blasting. These activities will create noise pollution in the surrounding area that affects the life of the nearby habitats.

**Impact on Soil**

Soil disruptions can contribute to the deterioration of the area's flora and fauna. There is also a huge possibility that many of the surface features that were present before mining activities cannot be replaced after the process has ended. The removal of soil layers and deep underground digging can destabilize the ground which threatens the future of roads and buildings in the area.

**Impacts on Flora & Fauna**

Often, the worst effects of mining activities are observed after the mining process has ceased. The destruction or drastic modification of the pre-mined landscape can have a catastrophic impact on the biodiversity of that area. Mining leads to a massive habitat loss for a diversity of flora and fauna ranging from soil microorganisms to large mammals. Endemic species are most severely affected since even the slightest disruptions in their habitat can result in extinction or put them at high risk of being wiped out. Toxins released through mining can wipe out entire populations of sensitive species.

## 22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT.

The major potential environmental impacts associated with mining and associated mineral processing operations are related to erosion-prone landscapes, soil and water quality, and air quality. These potential impacts are recognized and addressed in current mining operations as well as in some former mining operations by reclaiming areas of physical disturbance to prevent erosion, stabilizing soils containing metals or chemicals to prevent unwanted metal releases into the environment, preventing and/or treating water contamination, and controlling air emissions.

Mine closure and a number of activities to mitigate the impacts of mining are an integral part of all mine planning and mineral development from the discovery phase through to closure:

Reclamation

Soil treatment

Water treatment

Preventing acid rock drainage

Controlling gas emissions

### **Air**

Mitigation measures suggested for air pollution controls are to be based on the baseline ambient air quality of the project/cluster area and would include measures such as:

- Dust generation shall be reduced by using sharp teeth of shovels.
- Wet drilling shall be carried out to contain the dust particles.
- Controlled blasting techniques shall be adopted.
- Water sprinkling on haul roads, service roads and overburden dumps will help in reducing considerable dust pollution.
- Proper and regular maintenance of mining equipment's have to be undertaken.
- Minerals transported in trucks are to be covered with tarpaulin.

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*[Signature]*

- The mine pit water can be utilized for dust suppression in and around mine area.
- Information on wind direction and meteorology are to be considered during planning, so that pollutants, which cannot be fully suppressed by engineering techniques, will be prevented from reaching the nearby agricultural land, if any.
- Comprehensive greenbelt around overburden dumps and periphery of the mining projects/clusters has to be carried out to reduce to fugitive dust transmission from the project area in order to create clean & healthy environment.

### **Water**

- Construction of garland drains and settling tanks to divert surface run-off of the mining area to the natural drainage.
- Construction of checks dams/ gully plugs at strategic places to arrest silt wash off from broken up area.
- Retaining walls with weep hole are to be constructed around the mine boundaries to arrest silt wash off.
- The mined out pits shall be converted in to the water reservoir at the end of mine life. This will help in recharging ground water table by acting as a water harvesting structure.
- Periodic analysis of mine pit water and ground water quality in nearby villages are to be undertaken.
- Domestic sewage from site office & urinals/latrines provided within ML/QL areas is to be discharged in septic tank followed by soak pits.

### **Noise**

- Periodic maintenance of machineries, equipments shall be ensured to keep the noise generated within acceptable limit.
- Development of thick green belt around mining/cluster area, haul roads to reduce the noise.

- Provision of earplugs to workers exposed to high noise generating activities like blasting, excavation site etc. Worker and operators at work sites will be provided with earmuffs.
- Conducting periodical medical check-up of all workers for any noise related health problems.
- Proper training to personnel to create awareness about adverse noise related effects.
- Periodic noise monitoring at locations within the mining area and nearby habitations to assess efficacy of adopted control measures.
- During blasting optimum spacing, burden and charging of holes will be made under the supervision of competent qualified mines foreman, mate etc.

### **Biological Environment**

- Development of green belt/gap filling saplings in the safety barrier left around the quarry area/ cluster area.
- Carrying out thick greenbelt with local flora species predominantly with long canopy laves on the inactive mined out upper benches.
- Development of dense poly culture plantation using local floral species in the mining areas at conceptual stage if the mine is not continued much below the general ground level.
- Adoption of suitable air pollution control measures as suggested above.
- Transport of materials in trucks covered with tarpaulin.

**23. RECLAMATION OF MINED OUT AREA (BEST PRACTICE ALREADY IMPLEMENTED IN THE DISTRICT, REQUIREMENT AS PER RULES AND REGULATION, PROPOSED RECLAMATION PLAN).**

Mine reclamation is the process of restoring land that has been mined to a natural or economically usable state. Although the process of mine reclamation occurs once mining is completed, the planning of mine reclamation activities occurs prior to a mine being permitted or started. Mine reclamation creates useful landscapes that meet a variety of goals ranging from the restoration of productive ecosystems to the creation of industrial and municipal resources. Modern mine reclamation minimizes and mitigates the environmental effects of mining.

In Kalahandi district no stone Quarry has been reported as exhausted of mineral, hence no reclamation approach has been implemented in present date. Mainly two types of reclamation proposal are normally proposed i.e. Firstly Back filling of the exhausted mine by mine generated waste and capping of top soil for forest plantation and growth. Secondly proper fencing of quarried area and can be developed as water reservoir, fishery development or tourist attraction points after the life of the mine.

**24. RISK ASSESSMENT & DISASTER MANAGEMENT PLAN.**

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat. Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

It must be realized that any incident may develop into a major emergency even with the best safety measures and programmes in any industry. Hence, an Emergency procedure will be planned properly and documented to help in reducing time loss, chaos and confusion at the hour of need by assigning person who will engage in

meeting emergency smoothly and effectively. Any accident which has potential to develop into a major emergency can threaten large number of person or large area of the industries on the site may affect safety of the public, property and environment. Hence, it is absolutely essential that emergency procedures will be properly planned and documented.

Stone quarry mining is an opencast practice in the district, hardly cause disastrous situation except bench failure if the slope of the benches are not well maintained and height of the benches are exceptionally high not executed as per the approved Plan. Any disastrous situation raised in the mining area must be reported to the concern authorities as soon as possible.

**25. DETAILS OF THE OCCUPATIONAL HEALTH ISSUES IN THE DISTRICT. (LAST FIVE-YEAR DATA OF NUMBER OF PATIENTS OF SILICOSIS & TUBERCULOSIS IS ALSO NEEDS TO BE SUBMITTED).**

As per the data provided by CDMO, Kalahandi *Tuberculosis* patients cases of last 5 years is as follows;

Sl No	Year	TB Cases
01	2014	1633
02	2015	1703
03	2016	1629
04	2017	1411
05	2018	1427
06	2019	1224 till 14.10.19

No case of Silicosis recorded in the district.

**26. PLANTATION AND GREEN BELT DEVELOPMENT IN RESPECT OF LEASES ALREADY GRANTED IN THE DISTRICT.**

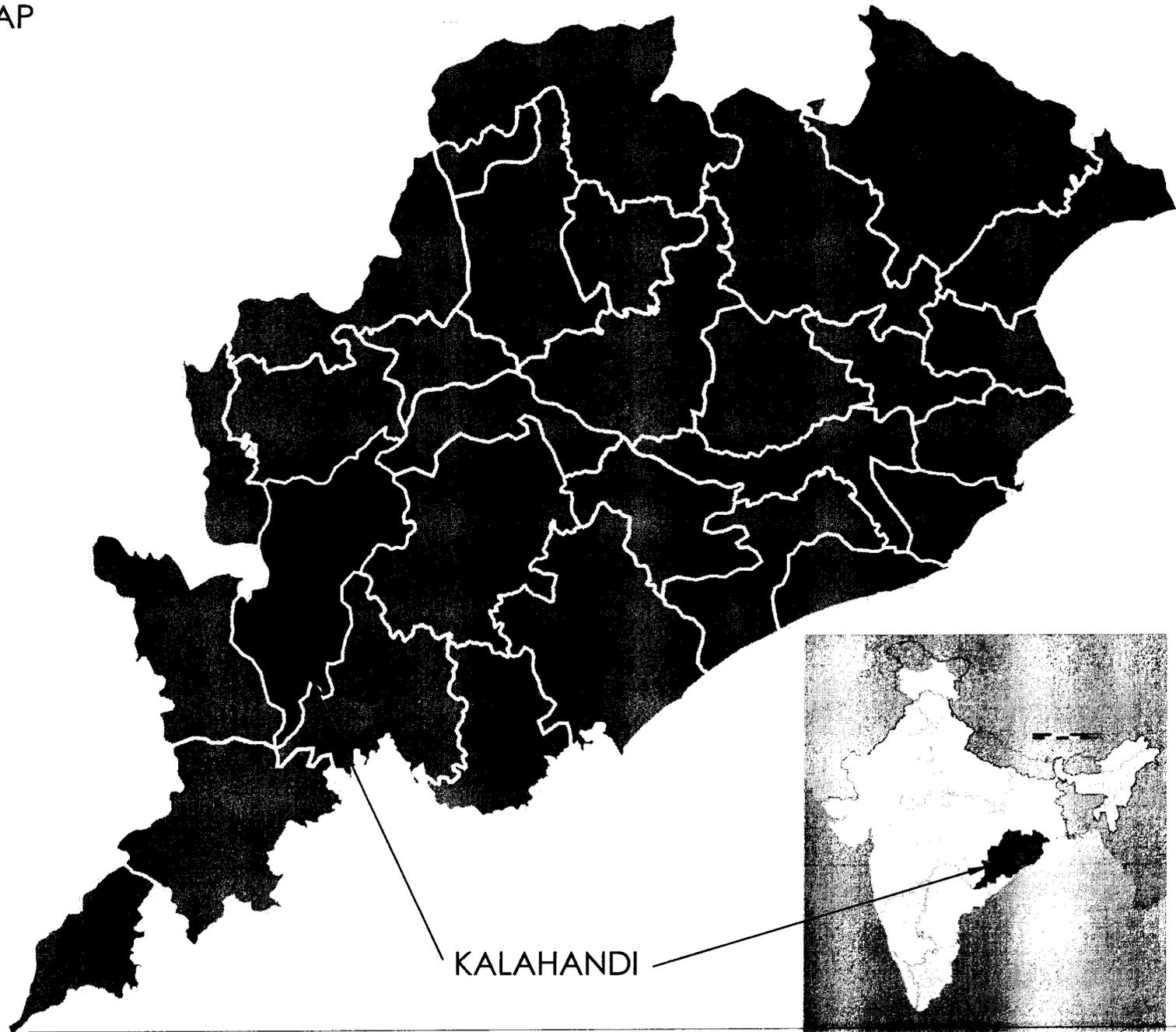
As the stone quarry lease within the district are non-forest lands rather revenue lands. As per the guidelines prescribed by OMMCR-2016 a safety zone of 7.5m has been considered for all quarry leases all along the inside of boundary line. Plantation proposal has been usually stated in the approved Mining Plans for all quarry leases. Saplings of local plants have been proposed to be planted in the safety zone area of quarries.

**27. ANY OTHER INFORMATION.**

Kalahandi district has a glorious rich cultural past, rich in agriculture. It is at the northern marginal area of Eastern Ghat Province having potential of several valuable minerals like Bauxite, gem stones, dimension stones, ordinary stones, sand etc. Systematic & scientific application of technologies in all fields will definitely enhance the livelihood of the common man of the area and the district can contribute a major part in thriving of the state as well as the nation.

INDEX MAP

PLATE-I



KALAHANDI



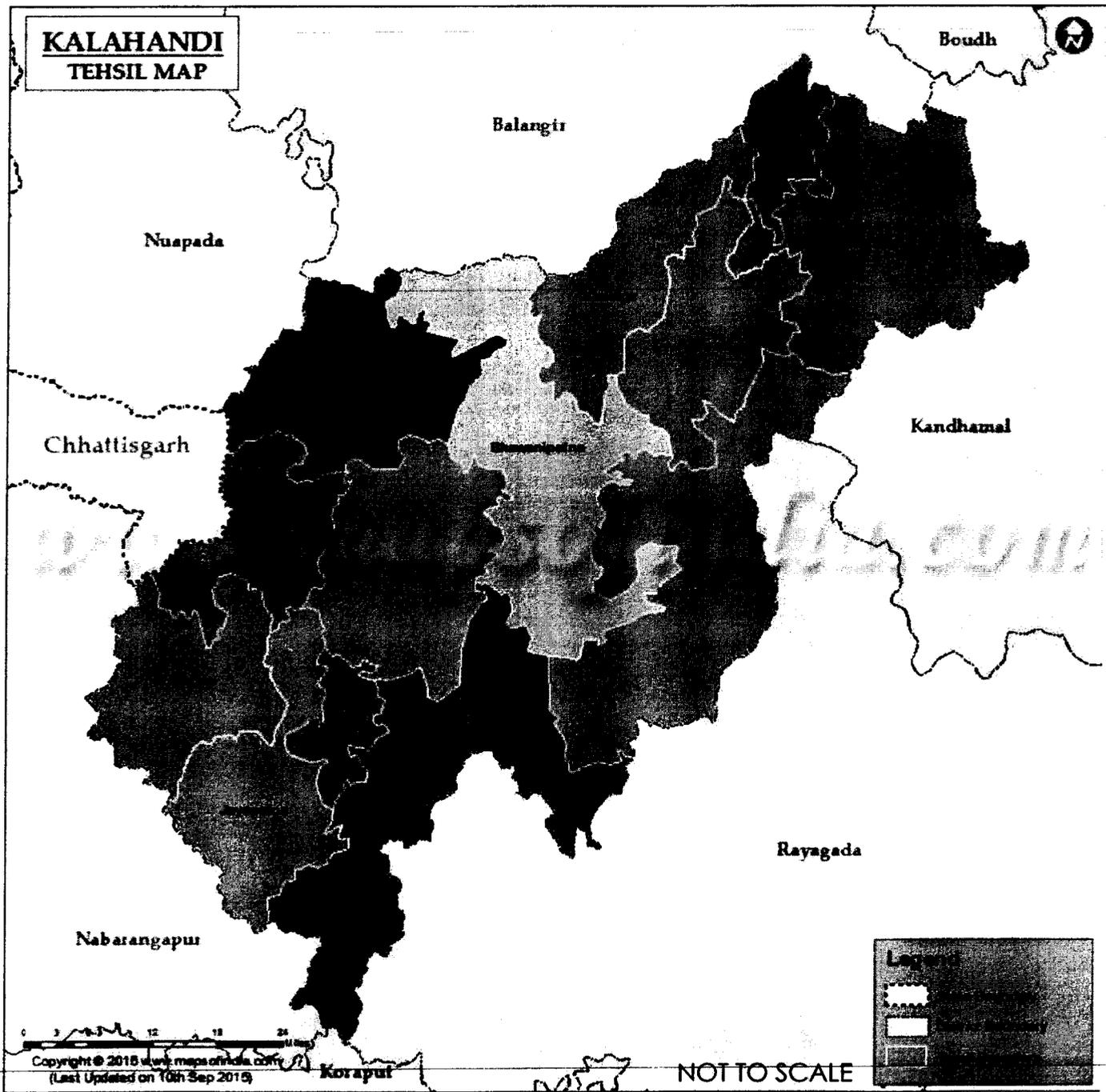
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**KALAHANDI  
TEHSIL MAP**



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(Last Updated on 10th Sep 2015)

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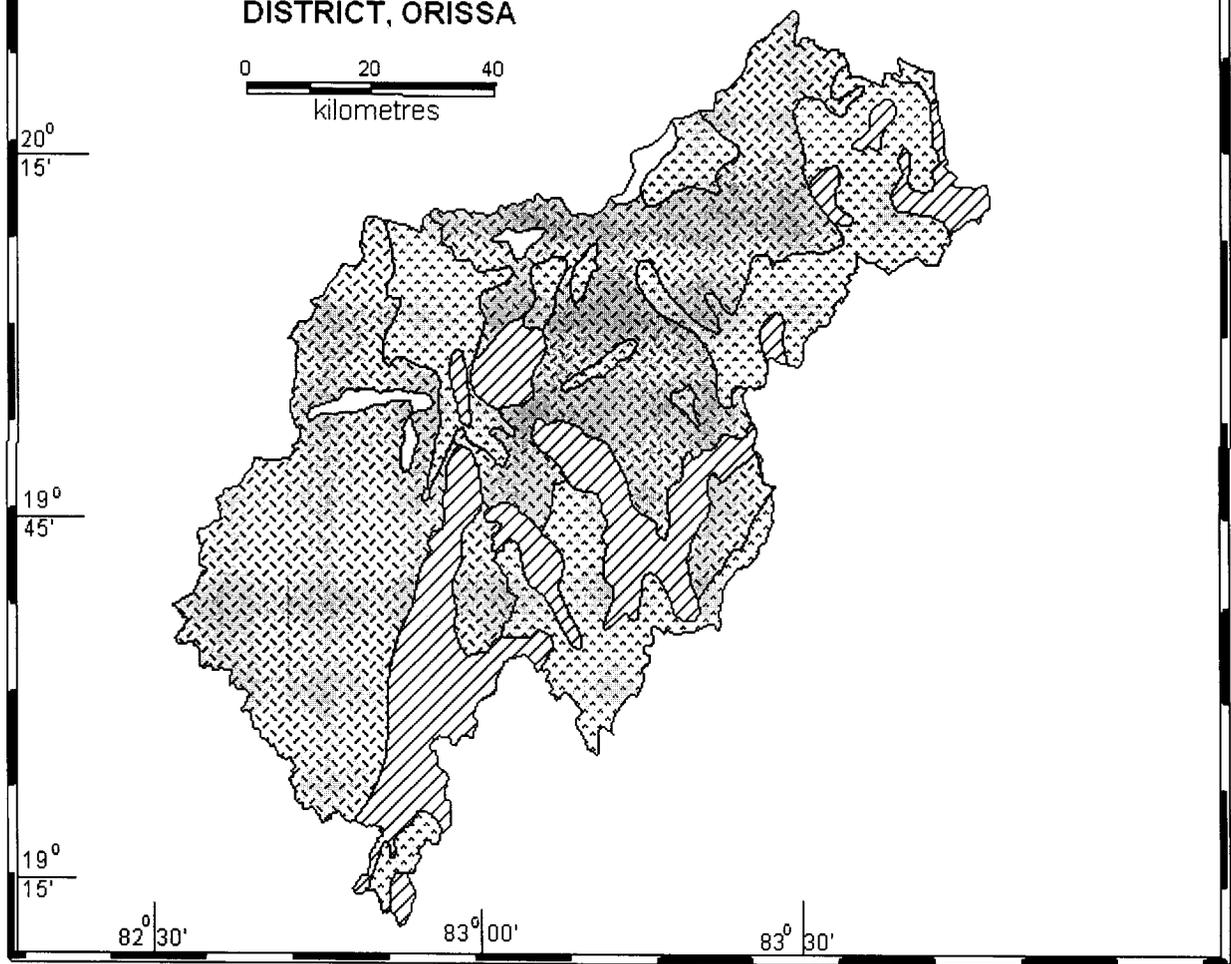
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**HYDROGEOLOGICAL MAP OF KALAHANDI DISTRICT, ORISSA**

Plate :- 5

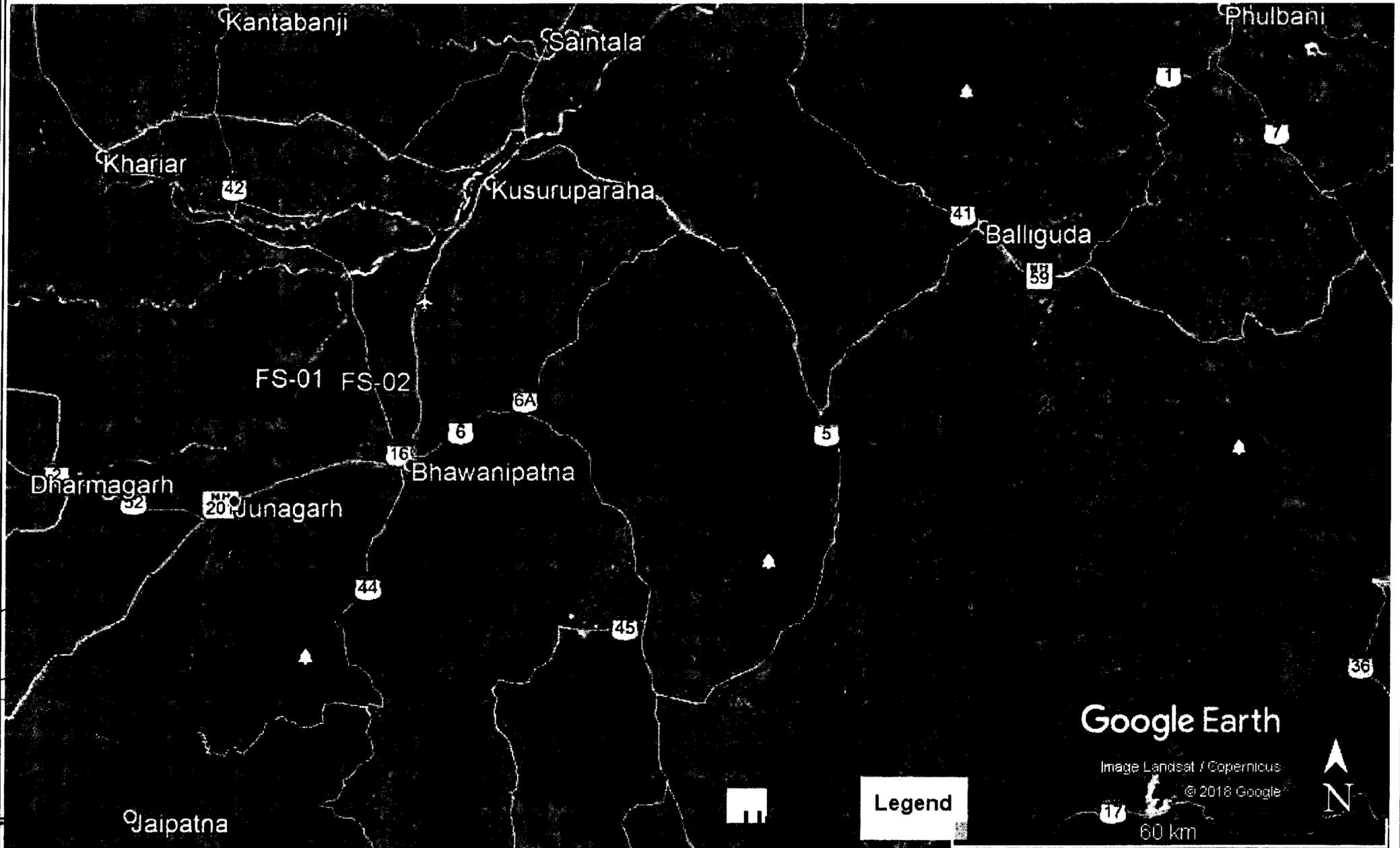


**LEGEND**

	<u>AGE GROUP</u>	<u>LITHOLOGY</u>	<u>HYDROGEOLOGICAL CONDITIONS</u> <u>POROUS FORMATIONS</u>	<u>GROUND WATER POTENTIAL</u>
UNCONSOLIDATED FORMATIONS CONSOLIDATED FORMATIONS	QUATERNARY	RECENT ALLUVIUM, LATERITES & LATERITIC GRAVELS	THIN DISCONTINUOUS PATCHES FORMING SHALLOW AQUIFERS	LIMITED TO MODERATE YIELD PROSPECTS BELOW 20m <sup>3</sup> /Hr.
	ARCHEAN	GRANITE & ITS VARIANTS  CHARNOCKITES  KHONDALITES	<b>FISSURED FORMATION</b> GROUND WATER RESTRICTED TO RESIDUUM AND FRACTURE ZONE HAVING SECONDARY POROSITY    	LIMITED TO MODERATE YIELD PROSPECTS BELOW 30 m <sup>3</sup> / Hr.

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MAP SHOWING LOCATION OF LEASES , ROADS, RIVERS ETC.



Bhikajharan Quartz & Feldspar Mines -FS-01  
Bhikajharan Quartz & Feldspar Mines -FS-02

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